

**ABSTRACT**

Dynamic vibration monitoring of a cutting tool or workpiece is provided by propagating an ultrasonic carrier beam in a stream of fluid flowing from a probe chamber, which includes a transducer, to the cutting tool or workpiece target area. The modulated ultrasonic beam reflected  
5 from the target is detected via a transducer in the chamber, and is demodulated to provide measurements of vibrational surface displacement and velocity. The method is insensitive to the target surface roughness and can be used for dynamic characterization prior to machining, and for monitoring during the machining operation. The device is inexpensive and robust to the machining environment, and can be applied to small cutting tools.